

5.6 Noise And Vibration

5.6.1 Introduction

The Noise and Vibration section of the EIR/EA analyzes the potential short-term, long-term, and cumulative impacts resulting from the construction and operation of the Project and alternatives. The noise and vibration discussion will analyze the noise and vibration conditions in the proposed Shingle Springs Interchange project area.

5.6.2 Environmental Setting

The existing noise environment is dominated by traffic on Highway 50. Ambient noise measurements were performed at four locations on both sides of the highway in early November 2000, at the locations shown by **Figure 5.6-1**. The noise measurement results are summarized in **Table 5.6-1**.

Sound measurement equipment consisted of Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters, which were equipped with B&K Type 4176 ½" microphones. The measurement equipment was calibrated immediately before and after use, and meets the pertinent specifications of the American National Standards Institute (ANSI) and the International Electrotechnical Institute (IEC) for Type 1 precision sound measurement systems.

Noise measurements were conducted in terms of the L_{eq} and other statistical descriptors. The noise level measurements were used to determine statistical trends in traffic noise levels throughout the day and nighttime periods, and to determine the peak hour traffic noise level and when the peak hour traffic noise level occurred. The measured peak hour traffic noise levels were later compared to values predicted by the Sound-32 model based upon existing conditions.

The data below shows that noise from traffic on Highway 50 is dominant at all of the monitoring locations.

The measured noise levels at Site 2 reasonably describe ambient noise levels in areas shielded from view of the highway. The measured noise levels at Sites 1, 3 and 4 reasonably describe the range of ambient noise levels at receiver locations that are *not* shielded from view of Highway 50.

Figure 5.6-1 Noise Measurement Locations

Table 5.6-1 Measured Noise Levels Shingle Springs Rancheria Area

Site	Date	L _{dn} , dB	Hourly L _{eq} , dBA		
			Peak Hour	Daytime Average	Nighttime Average
1	Nov. 1-2, 2000	67.7	66.9	65.2	60.1
1	Nov. 2-3, 2000	68.1	66.8	65.5	60.5
2	Nov. 1-2, 2000	51.3	51.2	45.1	44.9
2	Nov. 2-3, 2000	51.1	49.8	46.6	44.3
3	Nov. 1-2, 2000	62.5	61.2	58.5	55.5
3	Nov. 2-3, 2000	63.0	62.1	59.0	56.1
4	Nov. 1-2, 2000	65.1	63.5	62.0	57.7
4	Nov. 2-3, 2000	65.8	64.5	62.2	58.7

Source: BBA, 2001

As a sensitivity analysis, traffic noise levels for existing conditions were estimated for the generalized project area using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108). The FHWA model results are depicted in **Table 5.6-2**. According to this analysis, the noise impact threshold value of 65 dBA L_{eq} would be expected at receivers about 415 feet from the highway centerline during weekday peak hour traffic conditions, and at a distance of about 349 feet from the highway centerline during Saturday peak hour conditions. These values are conservative in that the analysis presumes that there is no significant attenuation of traffic noise by the site topography.

Table 5.6-2 Existing (Model Predicted) Traffic Noise Levels Highway 50: Existing Conditions

Condition	Peak Hour L _{eq} , dBA at 50 feet	Distance to 65 dBA L _{eq} Contour, feet
Weekday Peak Hour	79	415
Saturday Peak Hour	78	349

Source: BBA, 2001

To describe projected noise levels due to traffic at specific receiver locations, the Sound-32 traffic noise prediction model was used. The Sound 32 Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is considered to be accurate within 1.5 dB. The Sound-32 Model is the Caltrans coded version of the Federal Highway

Administration (FHWA) Traffic Noise Prediction Model. Sound-32 is the Caltrans version of the Stamina program, and reports noise levels in terms of the hourly L_{eq} for comparison to the Caltrans Noise Abatement Criteria.

Traffic noise levels were calculated at 10 receiver locations. Traffic data for the analysis were provided by the project traffic consultant. Free flow travel speeds were assumed. For the initial analysis, no accounting was made of potential topographic shielding. The predicted existing peak hour traffic noise level is about 2 dBA higher at Receiver 3 than the noise levels measured there November 1-3, 2000. At Receiver 10, the predicted peak hour traffic noise level is very close to the values measured there November 1-3, 2000.

Given that the site topography is complex relative to the roadway, and based upon field observations that the topography provided significant shielding of traffic noise at several receivers, the noise analysis was supplemented with an analysis of the shielding provided by the topography at the Highway 50 right of way. This was accomplished by inserting a barrier in the sound path from Highway 50 to the receivers, assuming that the right of way elevation was the top of a barrier. **Table 5.6-3** provides the results of the traffic noise modeling with and without consideration of the right of way topographic shielding, using a drop-off rate of -4.5 dB/doubling.

**Table 5.6-3 Predicted Traffic Noise Levels At Selected Receiver Locations
Existing Conditions**

Site Number	Description	Predicted Peak Hour L_{eq} , dBA	
		Without Topography	With Topography
f1	Residence	64	59
2	Residence	57	57
3	Monitoring Site 2	53	52
4	Residence	52	52
5	Residence	58	58
6	Residence	62	62
7	Residence	63	63
8	Residence	67	60
9	Residence	62	61
10	Monitoring Site 4	64	63

Source: BBA, 2001

The predicted noise levels in **Table 5.6-3**, assuming topographic shielding, may be considered reasonable representations of existing Highway 50 traffic noise at the receivers in the project area

5.6.3 Regulatory Setting

The criteria for evaluating noise impacts that are used by the Federal Highway Administration and Caltrans are contained in the October 1998 Caltrans Traffic Noise Analysis Protocol (The Protocol). According to the Protocol, under NEPA, impacts and measures to mitigate adverse impacts must be identified, including then identification of impacts for which no or only partial mitigation is possible. The FHWA regulations (23 CFR 772) constitute the Federal Noise Standard. These regulations state that noise abatement must be considered for Type 1 projects when the project results in a substantial noise increase, or when the predicted noise levels approach or exceed the Noise Abatement Criteria. Noise abatement measures which are reasonable and feasible and that are likely to be incorporated into the project, as well as noise impacts for which no apparent solution is available, must be identified and incorporated into the project's plans and specifications.

According to the Protocol, the Noise Impact Analysis must include the following elements: identification of land uses which may be affected by noise from the roadway, determination of the highest existing hourly noise levels, prediction of worst case hourly traffic noise levels using an accepted noise prediction methodology, and determination of traffic noise impacts for areas adjoining the project.

The unit of noise (sound) level measurement employed in this report is the A-weighted sound pressure level, denoted in decibels (dBA). The noise impact criteria are expressed in terms of the equivalent, or energy-average, hourly noise level, $L_{eq}(h)$, in dBA.

The Noise Abatement Criteria for various land uses are categorized on the basis of their sensitivity to noise. **Table 5.6-4** lists the Noise Abatement Criteria.

The Category B noise abatement criterion applies to residences, hotels, motels, churches, schools, recreation areas, active sport areas and parks, and is an hourly exterior sound level of 67 dBA, $L_{eq}(h)$. The Category E criterion also applies to residences, motels, hotels, schools, hospitals, and similar uses, and is an hourly interior sound level of 52 dBA $L_{eq}(h)$. The interior sound level criterion only applies in those situations where there are no exterior activities that are affected by the traffic noise.

Table 5.6-4 Activity Categories and Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level, dBA $L_{eq}(h)$	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Exterior	Developed lands, properties or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Caltrans Traffic Noise Analysis Protocol, 1998

5.6.4 Impacts And Mitigation Measures

Significance Criteria

According to the Protocol, a traffic noise impact will occur if a noise increase is substantial, which occurs when the predicted noise levels with the project exceed existing noise levels by 12 dBA, $L_{eq}(h)$.

A noise impact resulting from a substantial noise increase may additionally be a significant adverse environmental effect. To determine if the substantial noise increase is a significant adverse environmental effect, consideration must be given to the context and intensity of the substantial noise increase. Context refers to the project setting and uniqueness, or sensitive nature of the noise receivers. Intensity refers to the increase in noise levels over the “no build” condition, to the number of residential units affected, and to the absolute noise levels.

The Protocol further states that a traffic noise impact will also occur when predicted noise levels with the project approach within 1 dBA, or exceed, the Noise Abatement Criteria (NAC).

The Protocol also states that a *traffic noise impact* may occur if, as a result of a proposed freeway project, noise levels exceed 52 dBA $L_{eq}(h)$ within the interior of an existing public or private elementary or secondary school (Pursuant to Calif. Streets and Highways Code, Section 216).

For this analysis, it was assumed that a predicted traffic noise level of 65 dBA L_{eq} or more would approach or exceed the NAC at a residential receiver.

Methodology

Exterior Traffic Noise

The Sound-32 traffic noise prediction model was used to predict peak hour traffic noise levels at the selected receiver locations. In these cases, the - 4.5 dBA doubling rate was used only for Highway 50 traffic, as no noise measurement results can be applied to the ramp traffic. The results of these predictions are shown by **Table 5.6-5**. These predictions include the insertion loss (shielding) provided by the topography at the Highway 50 right of way.

At the nearest homes, which are represented by all of the above receivers except numbers 3 and 10, the predicted future peak hour traffic noise levels due to the project range from 55 dBA to 66 dBA. At receivers 1 through 5, 8, and 9, the predicted noise levels due to the project are below the threshold for a *traffic noise impact* as defined by the NAC.

The predicted future traffic noise levels at the above locations are 2 dBA to 4 dBA higher than the peak hour traffic noise levels at present. This increase in noise levels is less than the 12 dBA threshold for a substantial increase.

At receivers 6, 7, and 10, the predicted future cumulative traffic noise levels are at or above the NAC. The predicted changes in traffic noise levels at those locations due to the project are 1 dBA or less as compared to future No Project/Action conditions, which is less than the 12 dBA threshold for a substantial increase.

The total traffic noise exposure would be comprised of noise from traffic on both Highway 50 and the ramps. It is useful to consider the change in noise exposure expected from ramp traffic alone. Traffic noise levels were predicted which would be associated with only the on- and off-ramp traffic for the project. **Table 5.6-6** lists the predicted peak hour traffic noise levels for that analysis.

At the nearest homes, represented by sites 1, 2, and 4 through 9, the predicted future peak hour ramp traffic noise levels range from 53 dBA to 59 dBA. The predicted noise levels are below the threshold for significance as defined by the NAC.

In addition, the predicted future ramp traffic noise levels at Receivers 3 and 10 are about the same as the existing peak hour traffic noise levels, as demonstrated by the ambient noise measurements. The future Highway 50 traffic noise level will increase by 1 to 2 dBA in the No Project/Action condition. If the noise from the ramp traffic were to be added to the future (No Project/Action) noise level, the total noise levels at the sensitive receivers change by 2 dBA or less. This increase in noise levels is less than the 12 dBA threshold for a substantial change.

Table 5.6-5 Predicted Peak Hour Traffic Noise Levels At Selected Receiver Locations

Receiver	Peak Hour L_{eq} , dBA			
	Existing	Future No Project/Action	Flyover Interchange	Diamond Interchange
1	59	61	61	61
2	57	59	61	62
3	52	54	55	56
4	52	54	55	56
5	58	60	61	61
6	62	64	65	65
7	63	65	66	66
8	60	62	62	62
9	61	63	63	63
10	63	65	65	65

Source: BBA, 2001

Interior Traffic Noise

Typical facade construction in accordance with the UBC will provide an exterior to interior traffic noise reduction of 20 dBA to 25 dBA. It is usually assumed that all residences which are exposed to exterior noise levels of 67 dBA L_{eq} or less will comply with the Caltrans interior noise level criterion of 52 dBA L_{eq} . Based upon this analysis, none of the nearest residences will be exposed to exterior noise levels in excess of 67 dB L_{eq} . Therefore, interior noise levels at these locations are expected to comply with the Caltrans 52dBA L_{eq} interior noise level criterion.

Construction Equipment Noise

According to the Protocol, construction noise is only substantial in exceptional cases, such as pile driving and certain pavement rehabilitation operations. If construction noise on any highway project is anticipated to be a substantial problem, Standard Specifications Sections 7

and 42, and Standard Special Provisions provide limits on construction noise levels, and are used as appropriate.

Table 5.6-6 Predicted Project Traffic Noise Levels At Selected Receiver Locations Ramp Traffic Only

Site Number	Description	Predicted Peak Hour L_{eq} , dBA
1	Residence	58
2	Residence	58
3	Noise Monitoring Site 2	51
4	Residence	51
5	Residence	56
6	Residence	59
7	Residence	57
8	Residence	56
9	Residence	53
10	Noise Monitoring Site 4	56

Source: BBA, 2001

Impact/Mitigation

Impact 5.6-1 Traffic Noise Impact (Existing and Cumulative)

AA The No Project/Action Alternative would not result in construction activities or future commercial development of the Rancheria. ***No impact*** will result from the No Project/Action Alternative.

AB, AC At receivers 6 and 7, the predicted future cumulative traffic noise levels for AB and AC exceeds the NAC. The predicted changes in traffic noise levels at those locations due to the project are about 1 dBA as compared to future No Project/Action conditions, which is less than the 12 dBA threshold for a substantial increase. Under The Protocol, if a traffic noise impact is predicted, noise abatement measures must be evaluated and considered. If a traffic noise impact is not found to be a significant adverse environmental impact, the project sponsor must identify and implement all reasonable and feasible noise abatement measures. These noise abatement measures are considered project features, rather than mitigation. ***Therefore, the Flyover Interchange Design***

Alternative and the Diamond Interchange Design Alternative are not expected to result in a significant noise impact to the environment.

Mitigation 5.6-1 Traffic Noise Impact (Existing and Cumulative)

No mitigation is required. However, the Caltrans Protocol requires an analysis of potential noise abatement measures. The analysis revealed that it would not be feasible to provide noise barriers along the Highway 50 right of way for receivers 6 and 7. Therefore no barrier is required.

Impact 5.6-2 Construction Equipment Noise

AA The No Project/Action Alternative would not result in construction activities or future commercial development of the Rancheria. ***No impact*** will result for the No Project/Action Alternative.

AB, AC During the construction phase of the project, noise from construction activities would dominate the noise environment in the immediate area. Activities involved in construction would generate noise levels, as indicated in **Table 5.6-7** ranging from 70 to 90 dB at a distance of 50 feet. Construction activities would be temporary in nature, typically occurring during normal working hours. Construction noise impacts could be significant, as nighttime operations or use of unusually noisy equipment could result in annoyance or sleep disruption for nearby residences.

Construction noise is regulated by Caltrans standard specifications Section 7-1.01I "Sound Control Requirements". These requirements state that noise levels generated during construction shall comply with applicable local, state and federal regulations, and that all equipment shall be fitted with adequate mufflers according to the manufacturers' specifications.

During construction, noise generated by approaching traffic would be reduced due to a reduction in speed required by working road crews. Conversely, traffic noise levels of vehicles leaving the construction area would be slightly higher than normal due to acceleration. The net effect of the accelerating and decelerating traffic upon noise would not be appreciable. The most important project-generated noise source would be truck traffic associated with transport of heavy materials and equipment. This noise increase would be of short duration and limited primarily to daytime hours, but such noise impacts could be significant.

Table 5.6-7 Construction Equipment Noise Levels

Type of Equipment	Maximum Sound Level, dB, at 50 feet
Scrapers	88
Bulldozers	87
Heavy Trucks	88
Backhoe	85
Pneumatic Tools	85

Source: Environmental Noise Pollution, Patrick R. Cunniff, 1977

According to the Protocol, construction noise is only substantial in exceptional cases, such as pile driving and certain pavement rehabilitation operations. If construction noise on any highway project is anticipated to be a substantial problem, Standard Specifications Sections 7 and 42, and Standard Special Provisions provide limits on construction noise levels, and are used as appropriate. No substantial construction noise is anticipated for this project.

Noise levels resulting from potential blasting during construction are also a concern. Preliminary engineering work conducted for the project indicates that some of the exposed rock in the cutbank at the top of the ridge will need to be presplit prior to excavation (north and south of the Highway). Presplitting is defined as the establishment of a free surface or shear plane in rock along the specified excavation slope by the controlled use of explosives and blasting accessories in appropriately aligned and spaced drill holes. The specific type and location of blasting that may be required for this project have not been determined, and the noise levels from blasting activities are affected by many variables, which include the size of the explosive charge, relative timing of individual detonations, the amount of overburden that is covering the charges, and the time of day or night when the blast occurs. El Dorado County does not have noise-level criteria for evaluating noise impacts associated with blasting activities; however, blasting activities may disturb nearby residents ***This is considered to be a potentially significant impact.***

Mitigation 5.6-2 Construction Equipment Noise

The following mitigation will assure that the proposed project will result in a ***less than significant impact.***

General

- (A) Construction noise can be mitigated to less than significant levels by requiring compliance with Caltrans standard specifications Section 7-1.01I "Sound Control Requirements." These requirements state that noise levels generated during construction shall comply with applicable local, state and federal regulations, and that all equipment shall be fitted with adequate mufflers according to the manufacturers' specifications.

Rock Presplitting

- (B) Blasting will be performed in accordance with Caltrans' "Standard Specifications" including Sections 7-1.10 and 19-2.03). The specifications and special provisions developed for blasting will address safety issues and avoidance of damage to existing pavement, utilities, subdrains, structures, and other natural and human-made features.
- (C) Blasting will comply with the following recommendations:
 - (1) A qualified blasting contractor will be retained to determine the size, type, and location of blasting so as to minimize disturbance to nearby residents, and to ensure that no property damage will result from blast noise and vibration.
 - (2) Blasting will be conducted to minimize impacts on the traveling public. If possible, blasting will be conducted during non-peak, midmorning hours on Tuesdays, Wednesdays, or Thursdays. Blasting will be avoided during morning or afternoon peak-hour traffic conditions, and from noon on Friday to noon on Monday.
 - (3) The blasting contractor will be responsible for all traffic control during blasting, including stopping traffic in both directions, minimizing flyrock during the blasting, and cleaning up any blast debris.
 - (4) Changeable message signs will be used to notify the traveling public of traffic delays during blasting events.